

Brocade ICX and Cisco IOS Deployment Guide

Brocade ICX and CISCO IOS CLI and Configuration Reference Guide

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Preface

Introduction

This guide refers to the Brocade ICX 7150, ICX 7250, ICX 7450, and ICX 7750 switches running FastIron 08.0.61a software. The Brocade ICX 7650 is available in FastIron 08.0.70. The Cisco IOS uses a Cisco Catalyst 3750-E Series switch running Cisco IOS C3750E software (C3750E-UNIVERSALK9-M), 15.0(1)SE.

Purpose of This Document

This CLI reference and deployment guide compares some common commands in the switch operating systems between the Brocade ICX and Cisco IOS operating systems.

Audience

This guide describes static Cisco-to-Brocade switch configuration conversions and compares the CLI for managing Brocade ICX deployment by partners and system engineers.

This guide is designed to help Brocade partners and customers who:

- Manage multi-vendor networks that include Cisco switches.
- Have experience deploying Cisco switches and are now deploying Brocade ICX switches.

Document History

Date	Part Number	Description
October 26, 2017	800-71749-001	Initial release.

Power Over Ethernet

PoE is defined in the IEEE 802.3af-2003 standard and enables power-sourcing equipment (PSE) to supply up to 15.4 W of DC power to powered devices (PDs) through Ethernet interfaces over twisted-pair cables.

PoE+ is defined in the IEEE 802.3at-2009 standard and supplies up to 30 W of DC power to each device. This configuration covers PoE- and PoE+-capable devices.

TABLE 1 PoE Configuration Comparison

Cisco IOS	Brocade ICX
On the Cisco switch, PoE is enabled by default.	On the Brocade switch, PoE is disabled by default in FastIron up to release 08.0.61a. PoE will be enabled by default on the Brocade switch in FastIron release 08.0.70 and beyond.
<pre>Cisco(config-if)# power inline auto Cisco(config-if)# power inline never Cisco# show power inline Cisco# show power inline f1/0/5</pre>	<pre>Brocade(config-if-e1000-1/1/1)# inline power Brocade(config-if-e1000-1/1/1)# no inline power Brocade# show inline power Brocade# show inline power 1/1/1 ! interface ethernet 1/1/2</pre>

TABLE 1 PoE Configuration Comparison (continued)

Cisco IOS	Brocade ICX
	<pre> inline power !</pre>

Discovery Protocols: LLDP, CDP, and FDP

This section covers the commands required to configure three protocols used to discover devices on the network:

- Link Layer Discovery Protocol (LLDP), an industry standard protocol for device discovery
- Cisco Discovery Protocol (CDP), a Cisco-specific protocol for device discovery
- Foundry Discovery Protocol (FDP), a Brocade-specific protocol for device discovery

The Brocade ICX switches support all three protocols. Users should enable CDP and FDP for detecting these CDP-supported devices, such as Cisco phones.

TABLE 2 LLDP Configuration Comparison

Cisco IOS	Brocade ICX
<pre> Cisco(config)# lldp run Cisco# show lldp neighbors Cisco# show lldp neighbors g1/0/1 detail</pre>	<pre> Brocade(config)# lldp run Brocade(config)# show lldp neighbors Brocade(config)# show lldp neighbors detail ports ethernet 1/1/1</pre>

TABLE 3 CDP Configuration Comparison

Cisco IOS	Brocade ICX
<pre> Cisco(config)# cdp run Cisco# show cdp neighbors Cisco# show cdp neighbors g1/0/1 detail</pre>	<pre> Brocade(config)# cdp run</pre>

TABLE 4 FDP Configuration Comparison

Cisco IOS	Brocade ICX
Cisco does not support FDP.	<pre> Brocade(config)# fdp run Brocade(config)# show fdp neighbors Brocade(config)# show fdp neighbors detail</pre>

TABLE 5 LLDP Configuration

Cisco IOS	Brocade ICX
<pre> ! lldp run !</pre>	<pre> ! cdp run fdp run ! ! lldp run !</pre>

VLAN Configuration

This section compares the commands that are used to configure VLANs.

VLAN Membership Wrappers and Interface Range Command

In a Cisco configuration, the VLANs follow the interface hierarchy in the parser chain and preprocessing configuration. In a Brocade configuration, the interface follows the VLAN hierarchy for port-based VLANs. Thus, the Brocade device must create the VLAN configuration first, and tie it to interfaces for Layer 2 and Layer 3 processing.

On all Brocade devices, you can configure port-based VLANs. A port-based VLAN is a subset of ports on a Brocade device that constitutes a Layer 2 broadcast domain.

By default, all the ports on a Brocade device are members of the default VLAN. Thus, all the ports on the device constitute a single Layer 2 broadcast domain. When you configure a port-based VLAN, the device automatically removes the ports from the default VLAN and adds them to the VLAN.

You can configure multiple port-based VLANs. You can configure up to 4094 port-based VLANs on a Layer 2 switch or Layer 3 switch. On both device types, valid VLAN IDs are 1 through 4095. You can configure up to the maximum number of VLANs within that ID range.

VLAN membership configuration can be created easily using wrappers and **interface range** commands on the Cisco switch.

The Brocade switch also supports VLAN wrappers, multi-range VLANs, and the **interface range** command.

Brocade VLAN wrappers can be configured in the following ways:

- Single command support to add or remove an interface to all VLANs in the system.

```
Brocade(config-lag-brocade)# interface e 1/1/1
Brocade(config-if-e10000-1/1/1)# vlan-config add all-tagged
Brocade(config-if-e10000-1/1/1)# vlan-config remove all-tagged
```

- Single command support to move an untagged port from one VLAN to another VLAN.

```
Brocade(config-lag-brocade)# interface e 1/1/1
Brocade(config-if-e10000-1/1/1)# vlan-config move untagged 100
```

- Single command support to selectively add and delete VLANs at FastIron 08.0.70 and beyond.

```
Brocade(config)# interface e 1/1/1
Brocade(config-if-e10000-1/1/1)# vlan-config add tagged-vlan 101
Brocade(config-if-e10000-1/1/1)# vlan-config add tagged-vlan 102 113
Brocade(config-if-e10000-1/1/1)# vlan-config add tagged-vlan 1001 to 1005
Brocade(config-if-e10000-1/1/1)# vlan-config remove vlan 107 108 109 110
```

Multi-range VLANs allow users to use a single command to create and configure multiple VLANs. These VLANs can be continuous, for example, from 2 to 7, or discontinuous, for example, 2 4 7.

TABLE 6 Wrappers Comparison

Cisco IOS	Brocade ICX
<pre>Cisco(config)# interface range gigabitEthernet 1/1/1 - 4 Cisco(config-if-range)# switchport mode access</pre>	<pre>ICX7150-48ZP Switch(config-vlan-10)# untagged ethernet 1/1/1 to 1/1/4 Added untagged port(s) ethe 1/1/1 to 1/1/4 to port-</pre>

TABLE 6 Wrappers Comparison (continued)

Cisco IOS	Brocade ICX
<pre> Cisco(config-if-range)# switchport access vlan 10 Cisco(config-if-range)# switch port port-security Cisco(config-if-range)# switchport port-security violation restrict Cisco# show running-config interface gigabitEthernet 1/1/1 Building configuration... Current configuration : 160 bytes ! interface GigabitEthernet1/1/1 switchport access vlan 10 switchport mode access switchport port-security violation restrict switchport port-security end SW1(config)# interface gigabitEthernet 1/0/1 SW1(config-if)# switchport mode trunk SW1(config-if)# switchport trunk allowed vlan 10 SW1(config-if)# switchport trunk allowed vlan add 20 SW1(config-if)# switchport trunk allowed vlan add 30 SW1# show running-config interface gigabitEthernet 1/0/1 Building configuration... Current configuration : 101 bytes ! interface GigabitEthernet1/0/1 switchport trunk allowed vlan 10,20,30 switchport mode trunk end SW1# </pre>	<pre> vlan 10. ICX7150-48ZP Switch(config)# interface ethernet 1/1/1 to 1/1/4 ICX7150-48ZP Switch(config-mif-1/1/1-1/1/4)# port security ICX7150-48ZP Switch(config-port-security- mif-1/1/1-1/1/4)# violation restrict ICX7150-48ZP Switch(config-port-security- mif-1/1/1-1/1/4)# end ICX7150-48ZP Switch# show running-config interface ethernet 1/1/1 interface ethernet 1/1/1 port security violation restrict ICX7150-48ZP Switch(config)# vlan 10 20 30 ICX7150-48ZP Switch(config-mvlan-10*30)# tagged ethernet 1/1/5 ICX7150-48ZP Switch(config-mvlan-10*30)# Added tagged port(s) ethe 1/1/5 to port-vlan 10. Added tagged port(s) ethe 1/1/5 to port-vlan 20. Added tagged port(s) ethe 1/1/5 to port-vlan 30. ICX7150-48ZP Switch(config-mvlan-10*30)# </pre>

TABLE 7 Interface-level VLAN Wrappers

Cisco IOS	Brocade ICX
<pre> SW1(config)# interface gigabitEthernet 1/0/4 SW1(config-if)# switchport mode trunk SW1(config-if)# switchport trunk allowed vlan 101 SW1(config-if)# switchport trunk allowed vlan add 102-105 SW1(config-if)# switchport trunk allowed vlan add 1001-1005 SW1(config-if)# switchport trunk allowed vlan remove 1001-1003 SW1# show running-config interface gigabitEthernet 1/0/1 Building configuration... Current configuration : 101 bytes ! interface GigabitEthernet1/0/1 switchport trunk allowed vlan 101-105, 1004, 1005 switchport mode trunk end SW1# </pre>	<pre> ICX7150(config)# interface ethernet 1/1/4 ICX7150-48ZP Switch(config-if-e1000-1/1/4)# vlan- config add all-tagged INFO : Command may take approximately 1 Seconds ICX7150-48ZP Switch(config-if-e1000-1/1/4)# VLAN : [1005] Port(s) ethe 1/1/4 add to 10 vlan(s) complete..... ICX7150 (config-if-e1000-1/1/4)# VLAN : [1003] Port(s) ethe 1/1/4 add to 2 vlan(s) complete..... ICX7150 (config-if-e1000-1/1/4)# vlan-config remove vlan 1001 to 1003 Port(s) ethe 1/1/4 removed from VLANs 1001 to 1003 ICX7150 (config-if-e1000-1/1/4)# ICX7150 # show vlan brief ethernet 1/1/4 Port 1/1/4 is a member of 7 VLANs VLANs 101 to 105 1004 to 1005 Untagged VLAN : 1 Tagged VLANs : 101 to 105 1004 to 1005 ICX7150# </pre>

VLAN Configuration

VLAN Management (Access, Trunk, and Native VLAN)

VLAN Management (Access, Trunk, and Native VLAN)

This section compares the commands that are used to configure VLANs, trunks, and native and tagged VLANs.

In Cisco IOS, the term *trunk* refers to an interface that you configure to support 802.1Q VLAN tagged frames. That is, an interface that you configure to support multiple VLANs is a *trunk* interface in each VLAN in Cisco. In Brocade ICX, an interface that supports multiple VLANs is a *tagged* interface in each VLAN.

TABLE 8 Interface Types

Interface Use	Cisco IOS	Brocade ICX
Non-802.1Q interfaces (such as used for computers)	Access	Untagged
802.1Q interfaces (such as used for switch-to-switch, switch-to-server, and switch-to-VoIP phones)	Trunk	Tagged
Specify a native VLAN for untagged 802.1Q frames on a trunk port	Native VLAN	Dual mode

TABLE 9 Creating and Naming a VLAN

Cisco IOS	Brocade ICX
<pre>Cisco(config)# vlan 220 Cisco(config-vlan)# name test</pre>	<pre>Brocade(config)# vlan 220 name test</pre>

TABLE 10 Assigning Interfaces to VLANs

Cisco IOS	Brocade ICX
Trunk	Tagged
<pre>Cisco(config)# interface g1/0/6 Cisco(config-if)# switchport trunk encapsulation dot1q Cisco(config-if)# switchport trunk allowed vlan 220 Cisco(config-if)# switchport mode trunk Cisco(config-if)# switchport nonegotiate</pre>	<pre>Brocade(config-vlan-220)# tagged ethernet 1/1/1</pre>
<pre>Cisco(config)# interface g1/0/4 Cisco(config-if)# switchport Cisco(config-if)# switchport access vlan 220 Cisco(config-if)# switchport mode access</pre>	<pre>Brocade(config-vlan-220)# untagged ethernet 1/1/2</pre>
<pre>Cisco# show vlan id 220</pre>	<pre>Brocade# show vlan 220</pre>

TABLE 11 802.1Q Native VLAN and Brocade Dual Mode

Cisco IOS	Brocade ICX
Trunk and Native on one port	Tagged and untagged on one port
<pre>Cisco(config)# interface g1/0/6 Cisco(config-if)# switchport trunk encapsulation dot1q Cisco(config-if)# switchport trunk allowed vlan 220</pre>	<pre>Brocade(config-vlan-220)# tagged ethernet 1/1/6 Brocade(config-vlan-200)# tagged ethernet 1/1/6 Brocade(config)# interface ethernet 1/1/6 Brocade(config-if-e1000-1/1/6)# dual-mode 200</pre>

TABLE 11 802.1Q Native VLAN and Brocade Dual Mode (continued)

Cisco IOS	Brocade ICX
<pre>Cisco(config-if)# switchport mode trunk Cisco(config-if)# switchport nonegotiate Cisco(config-if)# switchport trunk native vlan 200</pre> <p>NOTE Native VLAN 200 specifies a native VLAN for untagged 802.1Q frames.</p>	<p>NOTE Dual mode specifies a native VLAN for untagged 802.1Q frames.</p> <p>NOTE The dual-mode command without a VLAN specifies the default VLAN ID.</p>
<pre>Cisco# show interfaces gigabitEthernet 1/0/6 switchport Name: Gi1/0/19 Switchport: Enabled Administrative Mode: trunk Operational Mode: down Administrative Trunking Encapsulation: dot1q Negotiation of Trunking: On Access Mode VLAN: 1 (default) Trunking Native Mode VLAN: 200 (VLAN0200) Administrative Native VLAN tagging: enabled Voice VLAN: none Administrative private-vlan host-association: none Administrative private-vlan mapping: none Administrative private-vlan trunk native VLAN: none Administrative private-vlan trunk Native VLAN tagging: enabled Administrative private-vlan trunk encapsulation: dot1q Administrative private-vlan trunk normal VLANs: none Administrative private-vlan trunk associations: none Administrative private-vlan trunk mappings: none Operational private-vlan: none Trunking VLANs Enabled: 220 Pruning VLANs Enabled: 2-1001 Capture Mode Disabled Capture VLANs Allowed: ALL Protected: false Unknown unicast blocked: disabled Unknown multicast blocked: disabled Appliance trust: none</pre>	<pre>Brocade(config-if-e1000-1/1/6)# show vlan 200 Total PORT-VLAN entries: 3 Maximum PORT-VLAN entries: 64 Legend: [Stk=Stack-Id, S=Slot] PORT-VLAN 200, Name [None], Priority level10, Spanning tree Off Untagged Ports: None Tagged Ports: None Uplink Ports: None DualMode Ports: (U1/M1) 6 Mac-Vlan Ports: None Monitoring: Disabled1/1/2 Brocade# show interfaces ethernet 1/1/6 GigabitEthernet1/1/6 is down, line protocol is down Port down for 14 minute(s) 1 second(s) Hardware is GigabitEthernet, address is 609c. 9fab.cd5d (bia 609c.9fab.cd5d) Configured speed auto, actual unknown, configured duplex fdx, actual unknown Configured mdi mode AUTO, actual unknown EEE Feature Disabled Member of 2 L2 VLANs, port is dual mode in Vlan 200, port state is BLOCKING BPDU guard is Disabled, ROOT protect is Disabled, Designated protect is Disabled Link Error Dampening is Disabled STP configured to ON, priority is level10, mac- learning is enabled Openflow is Disabled, Openflow Hybrid mode is Disabled, Flow Control is config enabled, oper enabled, negotiation disabled Mirror disabled, Monitor disabled Mac-notification is disabled Not member of any active trunks Not member of any configured trunks No port name IPG MII 0 bits-time, IPG GMII 0 bits-time MTU 1500 bytes, encapsulation ethernet 300 second input rate: 0 bits/sec, 0 packets/ sec, 0.00% utilization 300 second output rate: 0 bits/sec, 0 packets/ sec, 0.00% utilization 0 packets input, 0 bytes, 0 no buffer Received 0 broadcasts, 0 multicasts, 0 unicasts 0 input errors, 0 CRC, 0 frame, 0 ignored 0 runts, 0 giants 0 packets output, 0 bytes, 0 underruns Transmitted 0 broadcasts, 0 multicasts, 0 unicasts 0 output errors, 0 collisions</pre>

VLAN Configuration

VoIP Support with Voice VLAN: PC Connected to Phone and Phone to ICX Switch

TABLE 11 802.1Q Native VLAN and Brocade Dual Mode (continued)

Cisco IOS	Brocade ICX
	Relay Agent Information option: Disabled UC Egress queues: Queue counters Queued packets Dropped Packets 0 0 0 1 0 0 2 0 0 3 0 0 4 0 0 5 0 0 6 0 0 7 0 0 MC Egress queues: Queue counters Queued packets Dropped Packets 0 0 0 1 0 0 2 0 0 3 0 0
Cisco# show vlan id 220	Brocade# show vlan 220
<pre>! lldp run ! ! interface GigabitEthernet1/0/4 switchport access vlan 200 switchport mode access ! interface GigabitEthernet1/0/6 switchport trunk native vlan 200 switchport trunk allowed vlan 200,220 switchport mode trunk switchport nonegotiate !</pre>	<pre>! cdp run fdp run ! ! lldp run ! ! vlan 1 name DEFAULT-VLAN by port ! vlan 200 by port tagged ethe 1/1/6 ! ! vlan 220 by port untagged ethe 1/1/1 ! interface ethernet 1/1/6 dual-mode 200 inline power !</pre>

VoIP Support with Voice VLAN: PC Connected to Phone and Phone to ICX Switch

When an IP phone connects to the switch, the access port (PC-to-telephone jack) of the IP phone can connect to a PC. Packets to and from the PC and to or from the IP phone share the same physical link to the switch and the same switch port.

ATTENTION

Voice VLAN is different between Cisco and Brocade.

On the Cisco switch, the **switchport voice vlan xx** command causes the switch to communicate with the phone via CDP/LLDP and ensures packets from the IP phone are put onto the voice VLAN. The VLAN ID configures the phone to forward all voice traffic through the specified VLAN.

In Brocade voice VLAN, the **voice-vlan xx** command is only for CDP. The switch communicates with the phone via CDP and ensures packets from the IP phone are put onto the voice VLAN. The VLAN ID configures the phone to forward all voice traffic through the specified VLAN.

LLDP MED commands cause the LLDP-MED to advertise VLAN 10 in its Network Policy TLV to LLDP only on the IP phone.

TABLE 12 Phone and PC Configuration

Cisco IOS	Brocade ICX
<pre> ! lldp run ! interface FastEthernet1/1/1 switchport access vlan 11 switchport mode access switchport voice vlan 10 spanning-tree portfast </pre>	<pre> ! lldp run fdp run cfp run ! vlan 11 tagged Ethernet 1/1/1 vlan 10 tagged Ethernet 1/1/1 ! interface Ethernet 1/1/1 dual-mode 11 voice-vlan 10 ! lldp med network-policy application voice tagged vlan 10 priority 6 dscp 46 ports ethe 1/1/1 to 1/1/2 </pre>
<pre> Cisco# show lldp neighbors detail </pre>	<pre> Brocade# show fdp neighbors Brocade# show lldp neighbors detail </pre>

Management VLAN

A management VLAN allows remote devices to access the switch by way of SSH, SNMP, SSL, and syslog to manage the switch with proper access credentials. Any VLAN can be leveraged or designated to be a management VLAN.

By default, the Brocade management IP address that is configured on a Layer 2 switch applies globally to all ports on the device. This configuration can be modified to apply on a specific VLAN and from a specific port.

On Brocade Layer 2 switches, the management IP address is configured globally and is accessible from any configured VLAN by way of any in-band and out-of-band port by default.

If you want to restrict the IP management address to a specific port-based VLAN, you can make that VLAN the designated management VLAN for the device. When you configure a VLAN to be the designated management VLAN, the management IP address you configure on the device is associated only with the ports and the management port in the designated VLAN. To establish a Telnet/SSH management session with the device, a user must access the device through one of the ports in the designated management VLAN. The default gateway is under this VLAN.

On Cisco Layer 2 switches, IP addresses can be configured on any configured VLAN and are only accessible from the assigned VLAN. Additionally, Cisco Layer 2 switches can have IP addresses assigned on all configured VLANs, but can only have one globally assigned default gateway for routed management connectivity. On the Cisco device, you configure a VLAN for management access and apply an IP address. The default gateway is applied globally.

TABLE 13 Management VLAN Configuration

Cisco IOS	Brocade ICX
<pre> Cisco> enable Cisco> configure terminal Enter configuration commands, one per line. End with CNTL/Z. Cisco(config)# vlan 10 Cisco(config-vlan)# name Management Cisco(config-vlan)# end Cisco(config)# interface vlan 10 Cisco(config-if)# ip address 10.1.1.10 255.255.255.0 SW1(config-if)# no shut Cisco(config-if)# Cisco(config)# int fal/1/1 Cisco(config-if)# switchport mode access Cisco(config-if)# switchport access vlan 10 </pre>	<pre> ICX7150(config)# ip address 10.20.74.100/25 ICX7150(config)# vlan 10 ICX7150(config-vlan-10)# untagged ethernet 1/1/1 ICX7150(config-vlan-10)# ICX7150(config-vlan-10)# management-vlan Out of band management interface untagged with VLAN 10 Management VLAN Configured. Clearing IPv4 ARP, IPv6 Neighbor ICX7150(config-vlan-10)# ICX7150(config-vlan-10)# default-gateway 10.20.74.1 1 </pre>
<pre> Cisco(config)# ip default-gateway 10.1.1.1 </pre>	<pre> ICX7150# show running-config vlan 10 vlan 10 by port untagged ethe 1/1/1 management-vlan default-gateway 10.20.74.1 1 ! ! ip address 10.20.74.100 255.255.255.128 ! ICX7150# </pre>

Link Aggregation: LACP and LAG

This section compares the commands that are used to configure Port Channels on Cisco and Brocade ICX switches.

TABLE 14 LACP Configuration

Cisco IOS Port Channel/LAG Configuration	Brocade ICX LAG Configuration
<pre> Cisco(config)# interface port-channel 1 Cisco(config-if)# switchport trunk encapsulation dot1q Cisco(config-if)# switchport trunk allowed vlan 220 Cisco(config-if)# switchport mode trunk Cisco(config-if)# switchport nonegotiate Cisco(config)# interface range g1/0/23 - 24 Cisco(config-if-range)# switchport trunk encapsulation dot1q Cisco(config-if-range)# switchport trunk allowed vlan 220 Cisco(config-if-range)# switchport mode trunk Cisco(config-if-range)# switchport nonegotiate Cisco(config-if-range)# channel-group 1 mode active Cisco# show lacp 1 internal Cisco# show interfaces etherchannel </pre>	<pre> Brocade(config)# lag brocade dynamic id 1 Brocade(config-lag-brocade)# ports ethernet 1/1/23 ethernet 1/1/24 **Note: adding the LAG into vlan 220 Brocade(config-vlan-220)# tagged lag 1 Added tagged port(s) lag lg1 to port-vlan 220. Brocade# show lag id 1 </pre>
<pre> ! interface Port-channell1 switchport trunk allowed vlan 220 switchport mode trunk switchport nonegotiate </pre>	<pre> ! ! lag brocade dynamic id 1 ports ethe 1/1/23 to 1/1/24 </pre>

TABLE 14 LACP Configuration (continued)

Cisco IOS Port Channel/LAG Configuration	Brocade ICX LAG Configuration
<pre> end ! interface GigabitEthernet1/0/18 switchport trunk allowed vlan 220 switchport mode trunk switchport nonegotiate channel-group 1 mode active end Current configuration : 184 bytes ! interface GigabitEthernet1/0/19 switchport trunk allowed vlan 220 switchport mode trunk switchport nonegotiate channel-group 1 mode active end </pre>	<pre> ! lag to_CISCO dynamic id 3 ports ethe 1/1/18 to 1/1/19 ! ! ! vlan 1 name DEFAULT-VLAN by port ! vlan 200 by port tagged ethe 1/1/7 ! ! vlan 220 by port tagged ethe 1/1/7 lag 1 lag 3 untagged ethe 1/1/1 ! ! </pre>

Spanning Tree Configuration

Cisco implements Per-VLAN Spanning Tree Plus (PVST+), which is based on the IEEE 802.1D standard (Spanning Tree Protocol [STP]). Unlike STP and RSTP, in which bridges in a LAN must forward their VLAN packets in the same spanning tree, PVST+ allows each VLAN to build a separate spanning tree, and ensures that only one active, loop-free path exists between any two nodes on a given VLAN. The Brocade ICX switch also supports this implementation.

TABLE 15 PVST Configuration

Cisco IOS Layer 2 Configuration	Brocade ICX Layer 2 Configuration
<pre> Cisco(config)# spanning-tree mode pvst Cisco(config)# spanning-tree vlan 220 priority 16384 Cisco(config)# interface g1/0/9 Cisco(config-if)# spanning-tree portfast </pre>	<pre> Brocade(config)# vlan 220 Brocade(config-vlan-220)# spanning-tree Brocade(config-vlan-220)# spanning-tree priority 16384 </pre> <p>NOTE Brocade does not have a similar spanning-tree portfast command for PVST.</p>

RPVST/RPVST+ and Spanning Tree Port Fast

Based on the IEEE 802.1w standard, Rapid Spanning Tree Protocol (RSTP) is an optimized version of the IEEE 802.1D standard, Spanning Tree Protocol (STP). It achieves rapid network convergence by allowing a newly elected root port or designated port to enter the forwarding state much quicker than STP under certain conditions. Cisco implements Per-VLAN Spanning Tree Plus (PVST+), which is based on the IEEE 802.1D standard (Spanning Tree Protocol [STP]) and additional proprietary extensions, or Rapid Per-VLAN Spanning Tree Plus (RPVST+), which is based on the IEEE 802.1w standard (Rapid STP [RSTP]) and additional proprietary extensions. Cisco also implements MSTP. Unlike STP and RSTP, in which bridges in a LAN must forward their VLAN packets in the same spanning tree, PVST+ allows each VLAN to build a separate spanning tree. RPVST+ is a proprietary spanning tree implementation that extends RSTP (802.1w) to run a separate spanning tree for each VLAN on the switch, and ensures that only one active, loop-free path exists between any two nodes on a given VLAN, enabling Layer 2 edge protocols to transition the user port to the forwarding state quicker.

TABLE 16 RPVST Configuration

Cisco IOS RPVST Configuration	Brocade ICX
<pre>Cisco(config)# spanning-tree mode rapid-pvst Cisco(config)# spanning-tree vlan 100 priority 12288 Cisco(config)# interface g1/0/9 Cisco(config-if)# spanning-tree portfast</pre>	<pre>Brocade(config)# vlan 100 Brocade(config-vlan-100)# tagged ethernet 1/1/1 Brocade(config-vlan-100)# spanning-tree 802-1w Brocade(config-vlan-100)# spanning-tree 802-1w priority 12288 Brocade(config-vlan-100)# show running-config vlan 100 vlan 100 by port tagged ethe 1/1/1 spanning-tree 802-1w spanning-tree 802-1w priority 12288 ! ! Brocade(config-if-e1000-1/1/1)# spanning-tree 802-1w admin-edge-port NOTE The previous command declares the port to be an operational edge for all VLANs. Brocade(config-if-e10000-1/2/1)# spanning-tree 8 admin-pt2pt-mac NOTE The previous command declares the port to be on a point-to-point link for all VLANs.</pre>

MSTP and Spanning Tree Port Fast

This section compares the commands that are used to enable a single instance of STP to manage multiple VLANs in the system.

TABLE 17 MSTP Configuration

Cisco IOS	Brocade ICX
<pre>Cisco(config)# spanning-tree mode mst Cisco(config)# spanning-tree mst configuration Cisco(config-mst)# name Cisco Cisco(config-mst)# revision 1 Cisco(config-mst)# instance 1 vlan 220 Cisco(config-mst)# instance 2 vlan 100 Cisco(config-mst)# instance 3 vlan 240 Cisco(config)# spanning-tree mst 0 priority 20480 Cisco(config)# spanning-tree mst 1 priority 16384 Cisco(config)# spanning-tree mst 2 priority 12288 Cisco(config)# spanning-tree mst 3 priority 8192</pre>	<pre>Brocade(config)# mstp scope all Enter MSTP scope would remove STP and topology group related configuration for system Are you sure? (enter 'y' or 'n'): y 'MSTP Start' need to be entered in order to activate this MSTP feature Brocade(config)# mstp start Brocade(config)# mstp name brocade Brocade(config)# mstp revision 1 Brocade(config)# mstp instance 1 vlan 220 Brocade(config)# mstp instance 2 vlan 100 Brocade(config)# mstp instance 3 vlan 240 Brocade(config)# mstp instance 1 priority 20480 Brocade(config)# mstp instance 2 priority 12288 Brocade(config)# mstp instance 3 priority 8192</pre>
<pre>Cisco(config)# interface g1/0/9 Cisco(config-if)# spanning-tree portfast Cisco(config-if)# spanning-tree mst 1 cost 1000 Cisco(config-if)# spanning-tree mst 1 port-priority 160</pre>	<pre>Brocade(config)# mstp admin-edge-port ethernet 1/1/9 Brocade (config)# mstp instance 1 ethernet 1/1/9 path-cost 1000 Brocade (config)# mstp instance 1 ethernet 1/1/9 priority 160</pre>

TABLE 17 MSTP Configuration (continued)

Cisco IOS	Brocade ICX
	<p>NOTE The <code>mstp admin-edge-port x/x/x</code> command defines this port to be an edge port.</p>
<pre>Cisco(config)# interface g1/0/10 Cisco(config-if)# spanning-tree link-type point-to-point</pre>	<pre>Brocade(config)# mstp admin-pt2pt-mac ethernet 1/1/10</pre> <p>NOTE The <code>mstp admin-pt2pt-mac x/x/x</code> command defines this port to be a point-to-point link.</p>
<pre>! spanning-tree mode mst spanning-tree extend system-id ! spanning-tree mst configuration name Cisco revision 1 instance 1 vlan 220 instance 2 vlan 100 instance 3 vlan 240 ! spanning-tree mst 0 priority 20480 spanning-tree mst 1 priority 16384 spanning-tree mst 2 priority 12288 spanning-tree mst 3 priority 8192 spanning-tree vlan 10 priority 8192 ! ! interface GigabitEthernet1/0/9 spanning-tree portfast end</pre>	<pre>! mstp scope all mstp name brocade mstp revision 1 mstp instance 0 vlan 1 mstp instance 0 vlan 200 mstp instance 1 vlan 220 mstp instance 1 priority 20480 mstp instance 2 vlan 100 mstp instance 2 priority 12288 mstp instance 3 vlan 240 mstp instance 3 priority 8192 mstp admin-edge-port ethe 1/1/9 mstp start !</pre>

Spanning Tree BPDU Guard

This section compares the commands that are used to filter BPDU frames received on user ports connected to the switches.

TABLE 18 BPDU Guard Configuration

Cisco IOS	Brocade ICX
<pre>Cisco(config)# interface g1/0/17 Cisco(config-if)# spanning-tree bpduguard enable Cisco(config-if)# spanning-tree bpdufilter enable</pre>	<pre>Brocade(config)# interface ethernet 1/1/4 Brocade(config-if-e1000-1/1/1)# stp-bpdu-guard Brocade(config-if-e1000-1/1/1)# stp-protect</pre>

Spanning Tree Root Guard

This section compares the commands that are used to prevent a user device connected to a switch from becoming a root port in STP to avoid sub-optimal packet forwarding.

TABLE 19 Root Guard Configuration

Cisco IOS	Brocade ICX
<pre>Cisco(config)# interface g1/0/17 Cisco(config-if)# spanning-tree guard root</pre>	<pre>Brocade(config)# interface ethernet 1/1/1 Brocade(config-if-e1000-1/1/1)# spanning-tree root-protect</pre>

Flexible Authentication

This section shows the configuration required to enable Dot1X, MAC Authentication, and RADIUS to make user devices securely connect to the network. This comparison shows side-by-side Cisco and Brocade CLI differences.

TABLE 20 Flexible Authentication Configuration

Cisco IOS	Brocade ICX
<pre>Cisco(config)# radius server ISE Cisco(config-radius-server)# address ipv4 172.20.254.4 auth-port 1645 acct-port 1646 Cisco(config-radius-server)# key cisco Cisco(config-radius-server)# end</pre>	<pre>Brocade(config)# radius-server host 172.20.254.4 auth-port 1645 acct-port 1646 default key cisco dot1x mac-auth web-auth Brocade(config)# end</pre>
<pre>Cisco(config)# radius-server dead-criteria time 5 tries 3</pre>	<pre>Brocade(config)# radius-server test test-user Brocade(config)# radius-server timeout 5 Brocade(config)# radius-server retransmit 3 Brocade(config)# radius-server dead-time 1</pre>
<pre>Cisco(config)# aaa authentication dot1x default group ise-group Cisco(config)# aaa authorization network default group ise-group Cisco(config)# aaa accounting dot1x default start- stop group ise-group</pre>	<pre>Brocade(config)# aaa authentication dot1x default radius Brocade(config)# aaa accounting dot1x default start-stop radius Brocade(config)# aaa accounting mac-auth default start-stop radius</pre>
<pre>Cisco(config)# aaa accounting update periodic 5</pre>	<pre>Brocade(config)# radius-server accounting interim-updates Brocade(config)# radius-server accounting interim-interval 5</pre>
<pre>Cisco(config)# aaa server radius dynamic-author Cisco(config-locsvr-da-radius)# client 10.1.100.21 server-key networknode</pre>	<pre>Brocade(config)# aaa authorization coa enable Brocade(config)# host 10.1.100.21 key networknode Brocade(config)# radius-client coa 1700</pre>
<pre>Cisco(config-locsvr-da-radius)# ip radius source- interface vlan 100</pre>	<pre>Brocade(config)# ip radius source-interface ve 100</pre>
<pre>Cisco(config-if)# authentication event fail action next-method</pre>	<pre>Brocade(config)# authentication auth-order mac- auth dot1x Brocade(config-if)# authentication mac-auth dot1x-override</pre>

TABLE 20 Flexible Authentication Configuration (continued)

Cisco IOS	Brocade ICX
<pre>Cisco(config-if)# authentication event server dead action authorize voice</pre>	<pre>Brocade(config)# authentication Brocade(config-authen)# voice-vlan number Brocade(config-authen)# auth-timeout-action critical-vlan voice voice-vlan</pre>
<pre>Cisco(config-if)# authentication timer reauthenticate server Cisco(config-if)# authentication timer inactivity server</pre>	N/A
<pre>Cisco(config-if)# authentication host-mode multi-auth</pre>	N/A
<pre>Cisco(config-if)# authentication order dot1x mab</pre>	<pre>Brocade(config)# authentication Brocade(config-authen)# authentication auth-order dot1x mac-auth</pre>
<pre>Cisco(config-if)# authentication port-control auto Cisco(config-if)# dot1x pae authenticator</pre>	<pre>Brocade(config-if)# authentication port-control auto</pre>
<pre>Cisco(config-if)# authentication periodic</pre>	<pre>Brocade(config)# authentication Brocade(config-authen)# re-authentication</pre>
<pre>Cisco(config-if)# mab</pre>	<pre>Brocade(config)# authentication Brocade(config-authen)# mac-auth enable Brocade(config-authen)# mac-auth enable ethernet 1/1/47</pre>
<pre>Cisco(config-if)# dot1x timeout tx-period 10</pre>	<pre>Brocade(config)# authentication Brocade(config)# dot1x timeout tx-period 10</pre>
<pre>Cisco# copy running-config startup-config</pre>	<pre>Brocade# write memory</pre>
<pre>! radius server ise address ipv4 10.1.100.21 auth-port 1812 acct-port 1813 key networknode ! radius-server dead-criteria time 5 tries 3 ! aaa group server radius ise-group server name ise ! aaa authentication dot1x default group ise-group aaa authorization network default group ise-group aaa accounting dot1x default start-stop group ise- group ! aaa accounting update periodic 5 ! aaa server radius dynamic-author client 10.1.100.21 server-key networknode server-key networknode ! ip radius source-interface vlan 100 ! system-auth-control !</pre>	<pre>! authentication critical-vlan 10 auth-default-vlan 70 voice-vlan 200 re-authentication dot1x enable dot1x enable ethe 1/1/47 dot1x timeout tx-period 10 mac-authentication enable mac-authentication enable ethe 1/1/47 auth-timeout-action critical-vlan voice voice- vlan ! aaa authentication dot1x default radius aaa authorization coa enable aaa accounting dot1x default start-stop radius aaa accounting mac-auth default start-stop radius ! radius-client coa host 10.1.100.21 key networknode radius-client coa port 1700 radius-server host 10.1.100.21 auth-port 1812 acct-port 1813 default key networknode dot1x mac- auth web-auth radius-server retransmit 3</pre>

Flexible Authentication

TABLE 20 Flexible Authentication Configuration (continued)

Cisco IOS	Brocade ICX
<pre>interface range g1/0/7-48 description ISE dot1x Port switchport access vlan 70 switchport mode access authentication event fail action next-method authentication event server dead action authorize voice authentication timer reauthenticate server authentication timer inactivity server authentication host-mode multi-auth authentication order dot1x mab authentication port-control auto authentication periodic mab dot1x pae authenticator dot1x timeout tx-period 10 !</pre>	<pre>radius-server timeout 5 radius-server test test-user radius-server accounting interim-updates radius-server accounting interim-interval 5 radius-server dead-time 2 ! interface ethernet 1/1/47 dot1x port-control auto !</pre>